

PROCEDURALIZING TEAMWORK IN AVIATION CREWS

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This project investigated whether appropriate procedural interventions can facilitate team process and outcomes. Specific crew procedures were designed to fit general Crew Resource Management (CRM) principles and the specific needs of a commercial airline. The procedures were trained and implemented as Standard Operating Procedure (SOP) for one fleet while a control fleet did not have the training or SOP interventions. Multiple evaluation methods used different samples of evaluators and different evaluation instruments. Evaluation data converged to confirm the positive effects of the interventions in the experimental fleet.

The majority of airline accidents are related to crew resource management (CRM) performance (NTSB, 1994). Most U.S. airlines have implemented some variant of CRM training, assuming that it would improve crew performance and safety. However, research must determine the most efficient and effective variants of CRM training and the most reliable and valid evaluation measures.

The goals of this project were to design, implement, and evaluate a procedural CRM training program at a commercial airline. Our approach differed from previous approaches in design, implementation, and evaluation. The new CRM procedures were designed by identifying key airline needs and specifying the application of appropriate CRM principles to those needs. The proceduralization provided a broad sequential framework, or a loose script, for communication among team members and coordination of required activities. The newly developed CRM procedures were renamed advanced crew resource management (ACRM).

ACRM implementation combined pilot training with congruent structural changes in flight operations. The structural changes formally integrated ACRM procedures into the pilot's standard operating procedure (SOP) and added ACRM steps and items into the Flight Operations Manual and Quick Reference Handbook. ACRM items were added to normal and abnormal checklists.

Two similar fleets from a commercial airline participated in the evaluation. Both fleets received traditional CRM training. Only the experimental fleet received the newly developed ACRM training and SOP changes; the control fleet received no additional training or changes. Baseline performance data were collected during the first year of the project prior to any ACRM training or SOP changes.

After two years of training implementation and practice, the effectiveness of ACRM was assessed using various evaluators and evaluation methods (Hansberger, Holt, Boehm-Davis, 1999; Holt, Boehm-Davis, & Hansberger, 1999; Incalcaterra & Holt, 1999; Ikomi, Holt, Boehm-Davis, and Incalcaterra 1999). The first evaluation was an analysis of simulator performance during recurrent training for both fleets. The second evaluation was Instructor-Evaluators'

comparative judgments of the performance of ACRM and non-ACRM trained crews. The third evaluation was a survey of pilots' attitudes and knowledge about ACRM, as well as the frequency with which they implemented ACRM procedures on the line and the perceived outcomes. The final evaluation was jump seat observations of line flights in both fleets made by a selected team of pilots.

All the methods involved in the multi-method evaluation converged to show better performance for the ACRM trained pilots compared to the non-ACRM trained pilots. The fundamental and specific implication of this study is that proceduralization of CRM can improve certain aspects of crew processes and outcomes. To the extent that the procedure is correctly designed, teams using the procedure had superior outcomes. The general implication of this study is that the proceduralization of vital teamwork components can aid in the improvement of team communication, planning, and decision-making as reflected in quality, quantity, timeliness, error correction, or other aspects of team performance.

ACKNOWLEDGEMENTS

This research was supported by FAA grant 94-G-034.

REFERENCES

- Hansberger, J. T., Holt, R. W. & Boehm-Davis, D. A. (1999) Instructor/evaluator evaluations of ACRM effectiveness. In *Proceedings of the Tenth International Symposium on Aviation Psychology*, Columbus, OH, OSU.
- Holt, R. W., Boehm-Davis, D. A. & Hansberger, J. T., (1999) Evaluating effectiveness of ACRM using LOE and line-check data. In *Proceedings of the Tenth International Symposium on Aviation Psychology*, Columbus, OH, OSU.
- Incalcaterra, K. A. and Holt, R. W. (1999) Pilot evaluations of ACRM programs. In *Proceedings of the Tenth International Symposium on Aviation Psychology*, Columbus, OH, OSU.
- Ikomi, P. A., Holt, R. W., Boehm-Davis, D. A. & Incalcaterra, K. A. (1999) Jump seat observations of ACRM effectiveness. In *Proceedings of the Tenth International Symposium on Aviation Psychology*, Columbus, OH, OSU.
- NTSB (1994). *Safety Study: A Review of Flightcrew-Involved Major Accidents of U.S. Air Carriers, 1978 through 1990*. Washington DC: National Transportation Safety Board.